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Original Research Article

Antibiotic resistant of causes of bacteremia in Kirkuk city

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Abstract: This study aimed to determine the frequency and Antibiotic resistant of bacteria causing bacteremia in blood specimens in Kirkuk, Iraq .A total of 309 blood samples were collected from infants and adults who were suffering from symptoms of bacteremia. There ages were ranged from (1 month - 80 years). Those patients were attended to Kirkuk General Hospital, Azadi Teaching Hospital in Kirkuk city from (1/July/2013) to (1/October/2014). The results indicated that 47 (31%) blood samples from both sexes, 21(12.7%) female and 26(18.2%) male, revealed positive cultures, consisting of 28 (59.6%) gram-positive isolates and 19 (40.4 %) gram-negative isolates. Gram-positive isolates were represented by: *Staphylococcus aureus* 18 (38.3%) and it was the predominant isolate followed by *Staphylococcus epidermidis* 10 (21.3%) and gram negative isolates were represented by: *Escherichia coli* 12 (25.5%) *Pseudomonas aeruginosa* 5(10.7%) *Klebsiella pneumoniae* 2(4.2%). The results also showed that the high age groups infected were (1-10 years) 9 (19.1%). Antibiotic susceptibility test revealed that gram-positive bacteria were susceptible to ciprofloxacin followed by Chloramphenicol, also the gram-negative bacteria were susceptible to ciprofloxacin followed by Chloramphenicol. From gram positive bacteria *Staphylococcus aureus* is predominant cause of bacteremia while from gram negative bacteria *Escherichia coli* is predominant.
Keywords: Kirkuk, Bacteremia, *Staphylococcus aureus*.

INTRODUCTION

Bacteremia is the presence of pathogenic bacteria in the blood stream [1, 2]. Clinically bacteremia benign where the host immune mechanisms eliminate the bacteria from the blood and lead to infection and sepsis in the blood stream [3, 4]. Microbes enter the body through the skin, gastrointestinal tract, and the respiratory tract [5]. Infections of the urinary tract, and intra abdominal infections are the commonest sites of origin of bacteremia [6]. Common oral hygiene, such as brushing or flossing, can cause transient but harmless bacteremia [7]. The etiology varies according to age, sex, geographic location, ecologic environment [8-10].

The incidences greater in males (especially older males), very young, and elderly patients [11, 12]. The common causative organisms being isolated from bacteraemic patient are gram positive represented by *Staphylococcus aureus*, *Staphylococcus epidermidis* , while gram negative organisms that commonly isolated are *Escherichia coli* ,*Klebsiella spp*, *Pseudomonas aeroginosa* [13, 14]. Prompt antibiotic therapy usually succeeds in clearing bacteria from the blood stream. Recurrence may indicate an undiscovered site of infection. Untreated bacteria in the blood may spread, causing infection of other organs such as heart, brain, kidney, spleen and liver [15].

RESULTS

The frequency of bacteremia among suspected patients is shown in table(1).The results indicated that bacteremia among suspected patients attended to the hospital was found to be 47(15.2%) in comparison with (–ve) cases which were about 262(84.8%) patients.

Table 1: Culture results of blood samples

Gender / Culture result	Male		Female		Total	
	No.	%	No.	%	No.	%
+ve culture	26	8.4	21	6.8	47	15.2
-ve culture (No growth)	117	37.9	145	46.9	262	84.8
Total	143	46.3	166	53.7	309	100

Etiology of bacteremia among the positives cases (table 2) was found to be ***S. aureus*** which is recovered with a percentage value of 18(38.3%) followed by ***S. epidermidis*** with a percentage 10(21.3%). While the most predominant gram negative bacteria causing bacteremia among patients was found to be ***E. coli*** which was recovered with a percentage value of 12(25.5%) followed by ***P. aeroginosa*** w 5(10.7%) and ***K. Pneumoniae*** 2 (4.2%).

Table 2: The causative agents of bacteremia in relation to the sex

Bacterial name	**male**	**female**	**Total of isolates %**
Gram positive			
Staphylococcus aureus	**11**	**7**	**18(38.3%)**
Staphylococcus epidermidis	**4**	**6**	**10(21.3%)**
Gram negative			
Escherichia coli	**6**	**6**	**12(25.5%)**
Pseudomonas aeruginosa	**4**	**1**	**5 (10.7%)**
Klebsiella pneumoniae	**1**	**1**	**2(4.2%)**
Total	**26**	**21**	**47(100%)**

The highs frequency of bacteremia was found in male 26(18.2%) in comparison to bacteremia in female 21(12.7%). The data provided the high frequency of bacteremia with patients aged (1-10) years with a percentage value of 9 (19.1%), followed by patients aged (11-20) years with 8 (17%) in both male and female (Table 3)

Table 3: Distribution of bacteraemic infection according to age and gender

Sex / Age Ranges	**Male**		**Female**		**Total**	
	No.	**%**	**No.**	**%**	**No.**	**%**
1day-29day	3	11.5	3	14.3	6	12.8
1month-10month	2	7.7	2	9.5	4	8.5
1-10years	7	26.9	2	9.5	9	19.1
11-20 year	2	7.7	6	28.6	8	17
21-30 year	3	11.5	-	-	3	6.4
31-40 year	-	-	3	14.3	3	6.4
41-50 year	5	19.2	2	9.5	7	14.9
61-70 year	4	15.4	3	14.3	7	14.9
Total	**26**	100	**21**	100	**47**	100

Table 4 show the antibiotic sensitivity of gram positive and gram negative bacteria to nine different type of antibiotic, *Staph. aureus*, and *Staph. epidermidis* the most reliably active drugs were ciprofloxacin (66.6%), (50%) ,chloramphenicol (50%), (40%), tetracycline (55.5%), (0%), amoxicillin (11.1%), (10%) and ampicillin (0%),amikacin (5.5%), (20%) respectively, and these bacteria shows no or less sensitivity to the other types of antibiotic.While among gram-negative bacteria (*E.coli ,K. pneumoniae and P. aeroginosa*) show high sensitivity to ciprofloxacin and no or less sensitivity for the other types of antibiotic**s.**

Table 4: Sensitivity profiles of isolates to nine different antibiotics

Bacterial isolate	**No.**	**C**	**CIP**	**TE**	**AK**	**AMC**	**AMP**	**NET**	**AZM**	**CTX**
S. aureus	18	9 (50%)	12 (66.6%)	10 (55.5%)	1 (5.5%)	2 (11.1%)	0	2 (11.1%)	0	0
S. epidermidis	10	4 (40%)	5 (50%)	0	2 (20%)	1 (10%)	0	1 (10%)	0	0
E. coli	12	2 (16.6%)	3 (25%)	0	2 (16.6%)	0	0	1 (8.3%)	1 (8.3%)	0
K. pneumoniae	2	1 (50%)	1 (50%)	1 (50%)	0	0	0	0	0	0
P. aeroginosae	5	0	2 (40%)	0	1 (20%)	0	1 (20%)	0	0	0

AK=Amikacin ; C =Chloramphenicol) ; CIP=Ciprofloxacin ; TE=Tetracycline ; AMC = Amoxicillin ;AMP = Ampicillin ; NET = Netilmicin ; AZM ; Azithromycin ; CTX ; Cefotaxime

DISCUSSIONS

In this study, forty seven patients were bacteraemic being caused by both gram positive 28(59.6%) and gram negative 19(40.4%) as shown in table 2. This result were in contrast with local study of [21] which found that infection with gram negative bacteremia 208(84.2%) is more than that of gram positive 39(15.7%), The variation can be attributed to various risk factors represented by age ,hygienic conditions and educations.

Staphylococcus aureus was predominant among gram positive isolates accounted for 18(38.3%) out of all isolate table 2. This organism is more invasive among gram positive bacteria and an important pathogen that lead to fatal bacteremia .This can be described its virulence factors and its ability to resist many antibiotic which facilitate its wide spread in environment and hospitals [22] the results of this study is different from other result which found that the predominant gram positive bacteria isolated from bacteraemic patient who have diabetic disease was *staphylococcus epidermidis* [36].

In this study coagulase negative staphylococcus (CoNS) represent the second pathogen among gram positive bacterial isolates 10(21.3%) of all isolates (table2),which is consistence with an indian authors who reported that CoNS incidence in infants with bacteremia was 16.3 % , but disagree with other study which represent that the most causing bacteremia is by *staphylococcus epidermidis* (41.74%) [23]. The reason for an increasing rate of CoNS may be related to the use of broad spectrum antibiotics and to the role of specific adherence and slime produced by CoNS, also the difference in the samples number [24]. The study show (table 2) that the most causative of bacteremia from gram negative bacteria were *Escherichia coli* 12(25.5%) and this disagree with result of [25] Who found that the most causative gram negative bacteria were *Enterobacter spp.* about 5(21.7%). But its agree with result that showed that *E.coli* was reported to be the most frequent gram negative bacterial species recovered from blood culture [26].

The pathogenic ability of *E. coli* largely afforded by the flexible gene pool through the gain and loss of genetic material .virulence factor involve mechanism that enable pathogenic bacteria to cause infection and in the presence to several putative virulence genes has been positively linked with the pathogenicity. *E. coli* bacteremia caused by strain with the K1 capsule [27, 28]. It has been observed in the results of this study that most of the gram negative bacterial isolates is a subsidiary of the family entero bacteriaceae, and for this reason that the majority of patients who were suffering from diarrhea caused one of the types of bacteria group one way or another, as it can be for these types of bacteria access to the bloodstream through the lining of the intestines [29]. Jawetz and his group in 1998 said that gram negative process of crossing easier than crossing process of gram positive are often resistant to antibiotics as a result of lack of permeability of the outer membrane of most antibiotics [30].

The pathogenesis of recurrent bacteremia may involve host factors that impair bacterial clearance, i.e., abnormalities of local or systemic host defense mechanisms or bacterial factors that confer a survival advantage (e.g., adhesins that facilitate mucosal colonization) [31]. Defects in local host defenses are known to be predisposing factors to the development of infection. For example, vesicoureteral reflux, renal scarring, benign prostatic hypertrophy, and the presence of urinary drainage devices are endotracheal factors to upper UTI and bacteremia [32] from table 3 the results showed that male 26(18.2%) is more infected with bacteremia than female 21(12.7%) , and this result agree with another study that found bacteremia were more prevalent among male patients than female (64.9% versus 35.1%) [33]. This is because female gender has been demonstrated to be protective under such conditions, whereas male gender may be deleterious due to a diminished cell-mediated immune response and cardiovascular functions. Male sex hormones, i.e., androgens, have been shown to be suppressive on cell-mediated immune responses. In contrast, female sex hormones exhibit protective effects which may contribute to the natural advantages of females under septic conditions. Male sex steroids appear to be immune depressive whereas female sex steroids increase the activity of humoral immune responses [81, 34]. The results show that all ages were affected, but the majority of bacteremia infection was in the age group (1-10 year) with frequency (19.1%) followed with age range (11-20 year) with frequency (17%), our result disagree with another study that confirmed bacteremia incidence were more in infant less than one month than other age groups [35]. The highest rate in these age groups may be related to sample number, study period and geographical area. The lowest frequency of bacteremia isolates were in patients with age ranges (21-30 year) and (31-40years) were (6.4%). This variation may relate in part to differences in samples size to the population studies and /or to environmental factors.

S. aureus were sensitive to ciprofloxacin 66.6%, chloramphenicol 50%, tetracycline, amikacin 5.5% this study vary with other results study that showed *S. aureus* were resist to amikacin with a percentage of 66.6% [84]. Amikacin is an aminoglycoside antibiotic and its used combined with

beta-lactam antibiotic for treatment, and resistant to amikacin caused by attack by most of antibiotic inactivating enzyme that are responsible for antibiotic resistant bacteria [37]. In case of *S. epidermidis* it was also sensitive to ciprofloxacin 50%, chloramphenicol 40%, amoxicillin 10%, this result is the same as results of another study which show that *S.epidermidis* sensitivity to amoxicillin were 7.8% [84]. It is the drug of choice because it is better absorbed, following oral administration than other beta-lactam antibiotics [38]. In case with gram negative bacteria ,the results show that ciprofloxacin were the most effective antibiotic, *E.coli* (25%), *P.aeruginosa*(40%), *Klebsella spp*.(50%).*E.coli* resistant to antibiotics depending on fact that many strain of *E.coli* have acquire plasmid coffering resistance to one or more than one type of antibiotics [36]. The study concluded that the frequency of bacteremia among male was found to be higher than female. Approximately high proportion of bacteremia was recorded in 1-10 year in both male and female and the most effective antibiotic used for bacteraemic patient is ciprofloxacin.

REFERENCES

1. Naber CK, Baddour LM, Giamarellos-Bourboulis EJ, Gould IM, Herrmann M, Hoen B, Karchmer AW, Kobayashi Y, Kozlov RS, Lew D, Miró JM. Clinical consensus conference: survey on Gram-positive bloodstream infections with a focus on Staphylococcus aureus. Clinical Infectious Diseases. 2009 May 15;48(Supplement 4):S260-70.
2. Christaki E, Giamarellos-Bourboulis EJ. The complex pathogenesis of bacteremia: from antimicrobial clearance mechanisms to the genetic background of the host. Virulence. 2014 Jan 1; 5(1):57-65.
3. Friedman ND, Kaye KS, Stout JE, McGarry SA, Trivette SL, Briggs JP, Lamm W, Clark C, MacFarquhar J, Walton AL, Reller LB. Health care–associated bloodstream infections in adults: a reason to change the accepted definition of community-acquired infections. Annals of internal medicine. 2002 Nov 19; 137(10):791-7.
4. Yardena SI, Boaz F, Ruth OW, Yoav G, Aliza N, David S, Michael G. Reappraisal of community-acquired bacteremia: a proposal of a new classification for the spectrum of acquisition of bacteremia. Clinical infectious diseases. 2002 Jun 1; 34(11):1431-9.
5. Schooley R, Wislon C. Host responses to infection. In: Cohen J, Powderly W, Opal S, eds. Infectious Diseases: MOSBY. 2010: 30-44.
6. Vallés J, Palomar M, Alvárez-Lerma F, Rello J, Blanco A, Garnacho-Montero J, Martín-Loeches I, GTEISEMICYUC Working Group on Bacteremia. Evolution over a 15-year period of clinical characteristics and outcomes of critically ill patients with community-acquired bacteremia. Critical care medicine. 2013 Jan 1; 41(1):76-83.
7. Forner L, Larsen T, Kilian M, Holmstrup P. Incidence of bacteremia after chewing, tooth brushing and scaling in individuals with periodontal inflammation. Journal of clinical periodontology. 2006 Jun 1; 33(6):401-7.
8. Kanoksil M, Jatapai A, Peacock SJ, Limmathurotsakul D. Epidemiology, microbiology and mortality associated with community-acquired bacteremia in northeast Thailand: a multicenter surveillance study. PloS one. 2013 Jan 18; 8(1):e54714.
9. Vincent JL, Rello J, Marshall J, Silva E, Anzueto A, Martin CD, Moreno R, Lipman J, Gomersall C, Sakr Y, Reinhart K. International study of the prevalence and outcomes of infection in intensive care units. Jama. 2009 Dec 2; 302(21):2323-9.
10. Reddy EA, Shaw AV, Crump JA. Community-acquired bloodstream infections in Africa: a systematic review and meta-analysis. The Lancet infectious diseases. 2010 Jun 30; 10(6):417-32.
11. Uslan DZ, Crane SJ, Steckelberg JM, Cockerill FR, Sauver JL, Wilson WR, Baddour LM. Age-and sex-associated trends in bloodstream infection: a population-based study in Olmsted County, Minnesota. Archives of internal medicine. 2007 Apr 23; 167(8):834-9.
12. Laupland KB, Kibsey PC, Gregson DB, Galbraith JC. Population-based laboratory assessment of the burden of community-onset bloodstream infection in Victoria, Canada. Epidemiology and infection. 2013; 141(01):174-80.
13. Kollef MH, Zilberberg MD, Shorr AF, Vo L, Schein J, Micek ST, Kim M. Epidemiology, microbiology and outcomes of healthcare-associated and community-acquired bacteremia: a multicenter cohort study. Journal of Infection. 2011 Feb 28; 62(2):130-5.
14. Gómez B, Mintegi S, Benito J, Garcia D, Astobiza E. Blood culture and bacteremia predictors in infants less than three months of age with fever without source. The Pediatric infectious disease journal. 2010 Jan 1; 29(1):43-7.
15. Mahon CR, Lehman DC, Manuselis Jr G. Textbook of diagnostic microbiology. Elsevier Health Sciences; 2014 Mar 25.
16. Raksha R, Srinivasa H, Macaden RS. Occurrence and characterisation of uropathogenic Escherichia coli in urinary tract infections. Indian journal of medical microbiology. 2003 Apr 1; 21(2):102.
17. Collee JG, Miles RS, Watt B. Tests for identification of bacteria. Mackie and McCartney practical medical microbiology. 1996; 14:131-49.
18. Mac Faddin JF. Biochemical tests for identification of medical bacteria. Williams & Wilkins Co.; 1976.

19. Bauer AW, Kirby WM, Sherris JC, Turck M. Antibiotic susceptibility testing by a standardized single disk method. American journal of clinical pathology. 1966 Apr; 45(4):493.
20. NCCLS, Performance Standards for Antimicrobial Disk Susceptibility Tests. NCCLS document M2-A7. Wayne, PA. 2000.
21. Al-Charrakh A. H.Al-MuhanaA.M. Al-SaadiZ. H, bacterial profile of blood stream infections in children less than threeold. Ph. J. Babylonon Univ, Iraq, 2005March; 10(3):481-485.
22. Mukonyora M, Mabiza E, Gould I.M. staph.aureus bacteremia in Zimbabwe, J.infect, 1985; 10: 233-239.
23. SabioPaz D.V, Solana C, Trietsch R, Donnell YA. Influenza A: UN acausa pocofrecuente de neumonia end period neonatal precoz. Arch.Argent.pediatr.aa 2001; (1): 55-57.
24. Kloos WE, Bannerman TL. Update on clinical significance of coagulase-negative staphylococci. Clinical microbiology reviews. 1994 Jan 1; 7(1):117-40.
25. Anwer Kadhim. Gram positive and gram negative percentage that causes bacteremia in children, Journal of Babylon university pure and applied Science, 2014; 22(4).
26. Anthony RM, Brown TJ, French GL. Rapid diagnosis of bacteremia by universal amplification of 23S ribosomal DNA followed by hybridization to an oligonucleotide array. Journal of clinical microbiology. 2000 Feb 1; 38(2):781-8.
27. Ulett GC, Totsika M, Schaale K, Carey AJ, Sweet MJ, Schembri MA. Uropathogenic Escherichia coli virulence and innate immune responses during urinary tract infection. Current opinion in microbiology. 2013 Feb 28; 16(1):100-7.
28. Wiles TJ, Kulesus RR, Mulvey MA. Origins and virulence mechanisms of uropathogenic Escherichia coli. Experimental and molecular pathology. 2008 Aug 31; 85(1):11-9.
29. Naaber P, Smidt I, Tamme K, Liigant A, Tapfer H, Mikelsaar M, Talvik R. Translocation of indigenous microflora in an experimental model of sepsis. Journal of medical microbiology. 2000 May 1; 49(5):431-9.
30. Jawetz E, Metnick JL, Adebry EA. Reviewofmedical microbiology ,21st ed London altose: lang medical puplication, 2000.
31. Arthur MI, Johnson CE, Rubin RH, Arbeit RD, Campanelli C, Kim C, Steinbach S, Agarwal MA, Wilkinson R, Goldstein R. Molecular epidemiology of adhesin and hemolysin virulence factors among uropathogenic Escherichia coli. Infection and immunity. 1989 Feb 1; 57(2):303-13.
32. Archambaud M, Courcoux P, Labigne-Roussel A. Detection by molecular hybridization of pap, afa, and sea adherence systems in Escherichia coli strains associated with urinary and enteral infections. In Annales de l'Institut Pasteur/Microbiologie 1988 Oct 31 (Vol. 139, No. 5, pp. 575-588). Elsevier Masson.
33. Shams Al-Deen AE. Bacteriological study on causes of bacteremia in children (Doctoral dissertation, M. Sc. Thesis, College of science, Kufa University. (In Arabic)).
34. Sakiani S, Olsen NJ, Kovacs WJ. Gonadal steroids and humoral immunity. Nature Reviews Endocrinology. 2013 Jan 1; 9(1):56-62.
35. Naher HS, Hasson SO, Al-Mrzoq JM. Gram-Positive Bacteremia in Febrile Children under two years of Age. 2013 May; 1(4): 6-10.
36. Al-Saadi MA, Al-Charrakh AH, Al-Greti SH. Prevalence of bacteremia in patients with diabetes mellitus in Karbala, Iraq. African Journal of Bacteriology Research. 2011 Jul 31; 3(7):108-16.
37. Available at: www.clinicattvial.gov/ct2/show/NCT01315678,2011.
38. Available at: www.tokue/Assets/MIC/Amoxicillin Clavulanate %20 Aug entin.pdf).retrived20july 2013.